3.1 INTRODUCTION

This chapter discusses the background information and preliminary findings of the Sustainable Industry Project's analysis of the photoimaging industry. This introduction outlines the contents of this chapter. The approach to our analysis, including the scope of the project, an industry profile, and our information sources are addressed in Section 3.2. Section 3.3 presents our findings to date, including:

(1) Information on the economic characteristics of the industry;

(2) Descriptions of key factors that influence environmental performance in this industry (drivers and barriers); and

(3) A list of policy options that might enhance the drivers and reduce the barriers to improved, more cost-effective environmental performance by the photoimaging industry.

3.2 APPROACH TO ANALYSIS

3.2.1 Scope

The photographic supplies and equipment manufacturing industry is classified under Standard Industrial Code (SIC) 3861, which includes the manufacture of:

- **Equipment:** still and motion picture camera and projection apparatus, photocopy and microfilm equipment, blueprinting and diazotype (white printing) apparatus, photocopy and microfilm equipment, and other photographic equipment; and

- **Supplies:** sensitized film, paper, cloth, and plates, and prepared photographic chemicals for use in processing sensitized products.

During our initial analysis of the photographic manufacturing and processing industry, we identified a number of characteristics which make the photographic processing segment attractive for in-depth study, compared to those identified for the photographic manufacturing industry which appeared far more limiting. As a result of these factors, outlined below, the EPA/IEc project team decided in Phase 1 of the project to focus on environmental issues in photoprocessing[1], though not to the exclusion of manufacturing issues. Photographic processing is classified under two SICs: SIC 7384, which comprises all photoprocessing except that of motion picture film; and SIC 7819, which comprises all support operations involved in the production of motion picture films, including the photoprocessing step.

The following are specific factors frequently identified by both manufacturers and photoprocessors which encouraged us to focus on photoprocessing:

- There was a high degree of industry interest in photoprocessing environmental issues. This interest reflects the difficulty some photoprocessors are having complying with local standards, due to their small size, lack of capital, and lack of technical expertise, as well as to the increasing stringency of some local standards.

- According to manufacturers, much of the impetus for their environmental innovation originates with their customers, the photoprocessors, who look for ease of compliance with environmental regulations, rapid picture development, and minimal waste generation.

- Innovative policy approaches may have especially high payoffs in the processing sector, which includes large numbers of small dischargers who are difficult to monitor for enforcement purposes.

- Given the small number of U.S. supplies manufacturers and the variation in their products, a focus on manufacturing might provide policy conclusions that were applicable to only one or two facilities. In contrast, similarities in products and processes among the numerous photoprocessors will likely lead to policies which are applicable throughout the sector.

Although we decided to focus on environmental issues in photoprocessing, this focus has required the participation of both manufacturers and processors as the product and process changes and much of the training that influence photoprocessors' environmental performance come from the manufacturers. Furthermore, we intend in Phase 2 of the project to conduct additional research into the barriers to innovation and drivers to environmental improvements in the manufacturing sector. We therefore continue to gather information from the manufacturing sector regarding sustainable practices.

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[1] The terms "photoprocessing," "photofinishing," and "photo developing" are interchangeable. For consistency, we use the term "photoprocessing" throughout this report.

We recognize that other potentially significant environmental issues have not yet been explored, and that we have not yet presented a full life-cycle characterization of environmental issues in this industry. There is no doubt, however, that the release of silver and other toxics from photoprocessing is one of the key environmental issues in this industry. Our initial focus on this issue has allowed us to develop a concrete understanding of environmental performance drivers and barriers and to begin considering policy options and specific pilot projects. It will be important in future work to keep in mind our relative lack of knowledge of environmental issues in manufacturing, and to pursue those issues in later stages of the process.

3.2.2 Overview of Industry

The two major segments addressed in the scope of the photoimaging industry -- sensitized goods manufacture and photoprocessing -- consist of very different products and processes and are structurally dissimilar. The manufacture of sensitized photographic goods involves, first, the preparation of the base, such as film or plates, for coating with a photographic emulsion. In the case of film, the material is generally an acetate-base plastic. Other inputs include plastic and metal for the film canisters and casing, numerous solvents, and the chemical emulsions. The base is then coated with an emulsion, usually of silver, to prepare it for capturing the image. The film is then prepared for sale by cutting and rolling it onto the film canister. The degree to which these activities are performed in-house varies with the manufacturer. Kodak, for instance, manufactures its own acetate film base and conducts emulsion and assembly in the same plant. Fuji and Konica, on the other hand, purchase the base from outside suppliers.

Production capacity of the photographic manufacturing industry is dominated by large companies, such as Kodak and Fuji. As mentioned, this industry concentration is one of the reasons behind our current focus on photoprocessors. The processing industry, in contrast, consists primarily of small, independently owned labs; minilabs within retail stores; and a few larger wholesale and mail-order processing labs. Most labs are engaged primarily in the processing of amateur pictures. Others specialize in the development of professional photography. Larger labs, such as mail-order labs and professional labs, tend to be more effective in implementing environmental controls, largely because capital is more available and the employees have more expertise in the field. The processing operations within these labs, however, are similar regardless of size and specialty.

Processing operations begin with the removal of exposed film from its housing canister. The processor then puts the film through a variety of chemical baths. First, a hydroquinone solution serves as the developer of the image; then, if the film being developed is color film, bleach is used to remove the remaining silver emulsion not contributing to the image; third, ammonium or sodium thiosulfate solution is used to fix the silver image to the film base; and finally, one or more washes remove any remaining chemicals and unexposed silver. As film is passed through the developer, bleach, and fix, these solutions are replenished with new solutions to maintain their effectiveness. The rate of replenishment is a factor in determining the amount of processing chemicals used. The majority of silver removed from the film base is in the bleach and the fix. Consequently, these two developing solutions are commonly passed through a recycling system to recover valuable silver.

Manufacturers and processors have a close relationship in this industry. Processors rely heavily on manufacturers for compliance assistance and innovations to address environmental and regulatory concerns. Manufacturing is driven in part by the demands placed upon the processors, both by regulators and by the end consumer. The result is an industry which is sensitive to environmental issues that are the focus of regulation at a more local level.

3.2.3 Information Gathering and Panel Meetings

In our efforts to fully understand the photoimaging industry as a system, we researched numerous areas, including the economic and financial characteristics of the industry, the products and processes involved, environmental issues, and current and future regulatory issues. Our first step was to review published documents for data on the size of the industry, the number of players, market growth rates, and end-use sectors. We also contacted the major trade associations. Interviews with the trade associations were extremely helpful in providing initial information on economic and environmental issues in the industry, and in identifying the names of individuals to contact in the industry itself.

We then conducted interviews with a number of industry, government, trade association, and environmental group contacts. We visited Kodak's major manufacturing facility and two photoprocessors. Because most photoprocessors discharge their wastewaters to publicly owned treatment works (POTWs), we also contacted the Association of Metropolitan Sewerage Agencies (AMSA) and several POTWs. The Veterans' Administration and the American Hospital Association provided information on medical uses of photoprocessing. To investigate issues related to silver recycling, we contacted the International Precious Metals Institute (IPMI). We also contacted researchers with the U.S. Geological Survey, the University of Wisconsin, and the Baltimore Academy of Natural Sciences to discuss the scientific evidence regarding the toxicity, fate, and transport of silver in the environment. Finally, we contacted representatives of the Environmental Defense Fund (EDF) and the Natural Resources Defense Counsel (NRDC) to assess the environmental community's position on the issues raised. Throughout this process, we had the help of Peter Krause, a consultant with extensive experience in the photographic industry. The list of sources used and organizations contacted is provided in Exhibit 3.2-1. A more detailed list of documents consulted is provided in Appendix 3-A, and the individuals interviewed are listed in Appendix 3-C to this chapter.

Exhibit 3.2-1

CONTACTS AND SOURCES FOR THE PHOTOGRAPHIC INDUSTRY

Documents	Industry Associations	Industry Members	Government	Non-Governmental Organizations
Toxics Release Inventory	National Association of Photographic Manufacturers	Eastman Kodak Co.	U.S. EPA	Environmental Defense Fund
Census of Manufactures	Photo Marketing Association International	Polaroid Corp.	- Office of Solid Waste - Office of Water - Office of Pollution Prevention and Toxics - Office of Air Quality Performance Standards - Office of Enforcement - Risk Reduction Engineering Lab - Region 1 - Region 4	Natural Resources Defense Counsel
U.S. Industrial Outlook	Silver Coalition	Fuji Photo Film USA	States	Association of Metropolitan Sewerage Agencies
Photography Trade News	Association for Information and Image Management	Fuji Hunt Photographic Chemicals	Department of Commerce	American Hospital Association
Wolfman Report on the Photographic Imaging Industry	Photographic Manufacturers and Distributors Association	Konica	State Pollution Prevention Roundtable	Baltimore Academy of Natural Sciences
Photoprocessing News, Incorporated	Printing Industries of America	3M Company	Palo Alto POTW	University of Wisconsin
	International Precious Metals Institute	DuPont	Hampton, VA Sanitation District	
		Ilford	U.S. Geological Survey	
		Agfa Division	Department of Veterans' Affairs	
		Mitsubishi International Corp.	Ontario Ministry of the Environment and Energy	
		Anitec Image		
		Advanced Photographic		
		Noble's Camera		
		Eckerd Drug Company		
		Eckerd Express Photo Center		
		FotoFast		
		Qualex, Inc.		
		Wal-Mart Stores, Inc.		
		ECS Refining		
		Handy & Harman		
		Envision Compliance Ltd.		

On January 13, 1994, we held the first of two expert panel meetings for this sector study. This meeting included only industry participants and experts. At this meeting, industry participants assisted us in identifying the drivers and barriers to improved environmental performance in the industry, and in determining potential arenas for environmental improvements. They also identified stakeholders in the photoimaging industry that we had not yet contacted.

The second expert panel meeting was held on February 25, 1994. This meeting included representatives from various U.S. EPA offices involved with the industry, POTWs, photoprocessors, and trade associations.[2] The objectives of this second panel meeting were to confirm our characterization of the industry, and to identify policy options with potential to promote improved environmental performance. At this meeting, the participants identified four policy areas as high priorities for work in Phase 2 of the project.

The organizations attending the first and second panel meetings are listed in Exhibit 3.2-2; each organization's representative is identified in Appendix 3-B.

Exhibit 3.2-2

PANEL MEETING PARTICIPANTS

Panel Meeting #1 January 13, 1994	**Panel Meeting #2 February 25, 1994**
Eastman Kodak Company Fujifilm USA Konica USA 3M Printing and Publishing Division DuPont Qualex, Inc.	National Association of Photographic Manufacturers Photo Marketing Association The Silver Coalition Noble's Camera (minilab) Association of Metropolitan Sewerage Agencies International Precious Metals Institute U.S. Department of Veterans' Affairs U.S. EPA Office of Water U.S. EPA Office of Solid Waste U.S. EPA Office of Enforcement U.S. EPA Office of Research and Development

Additional interviews are still required to obtain the views of all key stakeholders. In particular, we have had only limited contact with environmental groups, state regulators, and end-user representatives (especially non-medical). The project team will continue to solicit input from these and other experts and stakeholders as the project proceeds.

[2] Representatives from two environmental groups were invited to this meeting and accepted the invitation. Neither representative was able to attend, however, due to last minute conflicts.

3.3 MAJOR FINDINGS

3.3.1 Industry Characteristics

Industry Size and Structure

Manufacturers

Establishments in SIC 3861 produce a wide variety of products, only some of which directly relate to photoprocessing. Therefore, SIC-level data provide only an imprecise picture of economic trends in this industry. Exhibit 3.3-1 shows the composition of all products classified as SIC 3861 "Photographic Equipment and Supplies":[3]

Exhibit 3.3-1

COMPOSITION OF SIC 3861 PRODUCTS
(1987 Census of Manufactures)

Product	Number of Companies with Shipments of $100,000+	Value of Shipments (million $)
Still cameras (hand-held)	4	324.4
Still picture commercial type finishing equipment:		
. processing equipment for film	13	124.8
. processing equipment for paper	8	NA
. continuous printing machines	2	73.9
. all other (incl. developing machines, print washers & dryers)	5	NA
Other still picture equipment	NA	472.2
Photocopying equipment	NA	5,982.5
		(continued)

[3] Of the total value of shipments of SIC 3861 products ($15,324.3 million), 98 percent ($15,052.0 million) is produced by establishments whose primary products are classified in SIC 3861. That is, only a small part of the production of these products is accounted for by establishments primarily in other industries. Therefore, SIC 3861 captures virtually all of the products of interest, but covers other products as well.

Exhibit 3.3-1
(continued)

COMPOSITION OF SIC 3861 PRODUCTS
(1987 Census of Manufactures)

Product	**Number of Companies with Shipments of $100,000+**	**Value of Shipments (million $)**
Motion picture processing equipment	8	24.2
Other motion picture equipment	NA	164.4
Microfilming, blueprinting, and whiteprinting equipment	NA	382.9
Photographic sensitized film and plates, silver halide type (except X-ray): . still picture film . other film, plates and slides	 5 NA	 1,357.3 3,187.9
Sensitized photographic paper and cloth, silver halide type	6	*
Sensitized photographic film, plates, paper and cloth, other than silver halide type	NA	1,247.8
Prepared photographic chemicals: . office copy toner . other	 20 24+	 538.2 686.6
X-ray film and plates	9	*
Other photographic equipment and supplies	NA	757.0
Total	719**	15,324.3

Source: 1987 Census of Manufactures, Industry Series MC87-I-38B, Table 6a-1.
* Included with value of shipments for photocopying equipment.
** Industry representatives maintain that all SIC 3861 companies have shipments over $100,000; the 1987 Census of Manufacturers lists this total number of companies in a separate table.

Exhibit 3.3-1 shows that nearly half of the 1987 value of shipments (VOS) in this SIC relate to photocopying, microfilming, and motion picture equipment unrelated to camera picture-taking and processing. Another eight percent of the VOS are cameras and other non-processing related equipment and supplies. Approximately 33 percent or $5,092 million in VOS is related to silver halide sensitized film, plates and paper, and processing equipment supplies -- items relevant to our analysis. Of these, $547.3 million are shipments of processing equipment, and $4,545.2 million are shipments of supplies (e.g., film and paper).[4]

Exhibit 3.3-2 shows the distribution of establishments by their primary product.

Exhibit 3.3-2

1987 INDUSTRY STATISTICS BY PRIMARY PRODUCT CLASS SPECIALIZATION (SIC 3861)

Primary Product Class	Number of Establish-ments	Value of Shipments (million $)		New Capital Expenditures (million $)
		Total	Average/ Estab.	
Still picture equipment	64	821.3	12.8	27.6
Photocopying equipment	11	(D)	NA	(D)
Motion picture equipment	30	237.4	7.9	3.7
Microfilming, blueprinting, and whiteprinting equipment	21	287.8	13.7	6.0
Sensitized photographic film and plates, silver halide type	21	7,264.3	345.9	426.6
Sensitized photographic paper and cloth, silver halide type	3	(D)	NA	(D)
Sensitized photographic film, paper, and cloth other than silver halide type	42	1,521.5	36.2	55.3
Prepared photographic chemicals	28	622.5	22.2	18.3
X-ray film and plates	4	(D)	NA	(D)
Total SIC 3861	787	19,240.5	24.4	681.0

Source: 1987 Census of Manufactures, Industry Series MC87-I-38B, Table 5a.
(D) = withheld to avoid disclosing individual facility information.

[4] VOS for X-ray film and plates, and silver halide sensitized paper and cloth are combined with values from other SICs and cannot be separated; therefore, these figures understate the VOS for products covered by the scope of this study.

Exhibit 3.3-2 shows that 21 establishments produce silver-halide-sensitized film and plates, and another 3 produce silver-halide-sensitized paper and cloth as primary products. Exhibit 3.3-2 also shows that the 21 establishments producing silver-halide film and plates are larger on average than the establishments producing other products in this SIC, and account for a substantial portion of the industry's new capital expenditures.

Manufacturers with significant operations in the United States include:

- o Eastman Kodak Company,
- o Polaroid Corporation,
- o 3M Corporation,
- o Xerox,
- o Ilford (owned by International Paper), and
- o Anitec Image (also owned by International Paper).

Kodak is by far the largest U.S. manufacturer.[5] Polaroid Corporation is the second largest U.S. manufacturer, but their primary film product is instant film. Given our focus on photoprocessing issues, we excluded instant photography from our scope. Several foreign companies, such as Fuji and Konica, have established operations in the United States, but conduct the majority of their production operations abroad. The major foreign manufacturers include Fuji, Agfa (owned by Miles Incorporated), Konica, and Mitsubishi International Corporation.

Manufacturers supply processing systems which include both equipment and supplies to customers. Photoprocessors do not have to purchase chemical supplies from the same manufacturer that supplied the processing equipment, but many -- especially the smaller minilabs -- often do. All of the manufacturers have support systems to assist the processors with operations and environmental compliance. Such systems include instructional seminars, facility compliance evaluations, and compliance kits.

<u>Photoprocessors</u>

Cameras and film are sold in a wide variety of retail establishments, including general merchandise stores, gas stations, food and drug stores, and specialty camera and photographic supply stores.[6] However, photoprocessing supplies are sold only to the subset of establishments that perform photoprocessing on-site. These include commercial photoprocessing labs (wholesale and retail) and some camera stores, drug stores, and discount and mass merchandising stores. In addition, x-ray processing is done in large numbers of doctors', dentists', and veterinarians' offices and hospitals. An estimated total of 500,000 facilities perform some kind of photoprocessing.

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[5] For example, the Photo Marketing Association's 1991-1992 Industry Trends Report shows that Kodak accounts for 71 percent of color paper sales to U.S. amateur processing labs.

[6] The 1987 Census of Retail Trade reported 63,723 establishments as selling photographic equipment and supplies. Of these, only 3,791 were specialty camera and photographic supply stores.

Within commercial photoprocessing, industry sources distinguish between retail minilabs and larger wholesale, captive, or mail order labs (see Exhibit 3.3-3). The number of minilabs has grown rapidly over the past decade (from approximately 800 in 1981 to 17,200 in 1991). In 1991, minilabs were located in 3,100 camera stores; 7,100 stand-alone minilab outlets; and 2,700 mass-retail stores. This indicates a significant increase in the number of minilabs in mass-retail stores, which grew from 1,400 in 1989. The number of minilabs in other types of stores declined slightly over the same period.

Exhibit 3.3-3

ESTIMATED MARKET SHARE OF RETAIL Photoprocessing
(Share of Rolls Processed, 1991)

Retail Channel	Processed by Wholesale, Captive, or Mail Order Labs		Processed by Retail Minilab Equipment		Total	
	Mill. Rolls	%	Mill. Rolls	%	Mill. Rolls	%
Drugstore	148.5	21.1%	28.7	4.1%	177.2	25.2%
Stand-Alone Minilab	4.1	0.6%	116.0	16.5%	120.0	17.1%
Camera Store	25.0	3.6%	48.0	6.8%	73.0	10.4%
Discount/Mass Merchandiser	120.4	17.1%	17.6	2.5%	138.0	19.6%
Supermarket	82.5	11.8%	14.8	2.1%	97.4	13.9%
Mail Order	58.6	8.3%	0.0	0.0%	58.6	8.3%
Other	25.3	3.6%	12.6	1.8%	38.0	5.4%
Total	464.4	66.1%	237.7	33.9%	702.1	100.0%

According to industry representatives, the characteristics of large and small labs vary tremendously. Smaller labs have a limited capital base, and hence tend to be somewhat less sophisticated. Industry points out that there has been a trend toward concentration among photoprocessing labs over the past several years, largely as a result of restrictive environmental standards. They claim that compliance has become prohibitively expensive for small operations to achieve.

The characteristics of the various types of labs are shown in Exhibit 3.3-4.

Exhibit 3.3-4

CHARACTERISTICS OF AMATEUR FILM PROCESSING LABS[7]

Lab Type	Price	Quality	Processing Speed
Minilabs	Two to Three Times Higher than Others	Lower than Others	One Hour
Wholesale Labs (Drug Stores, Grocery Stores)	Medium	Equal to Minilabs	Two to Three Days
Mail Order Labs	Low	High	One Week

Photoprocessors vary in size, as follows:

- o Over 90 percent are small to medium, employ less than ten people, discharge less than 10,000 gallons of wastewater per day, and generate less than 100 gallons of silver-rich solution per week.
- o About 9 percent are large, discharge 10,000 to 25,000 gallons of wastewater, per day and generate 100 to 250 gallons of silver-rich solution per week.
- o Less than 1 percent are significant industrial users which discharge over 25,000 gallons of process wastewater per day. These include most hospitals; a few diagnostic clinics, printers, and photoprocessors; and the major motion picture film processors.

Consumers of Photoprocessing

The market for photographic services and supplies is divided into three major segments:

- o Medical applications,
- o Graphic arts, and
- o Amateur photography.

Other photoprocessors include labs serving professional photographers, and various government agencies, such as police departments and the Department of Defense. The product consumed varies among these segments.

[7] Consumer Reports, November 1993, pp. 711-715.

Medical users include large hospitals and diagnostic clinics, as well as doctors' offices and veterinarians. The largest single user in the medical market is the Veterans' Administration. The medical industry purchases developing products for use in processing. The final consumer, the patient, is concerned not about the x-ray itself, but about the diagnosis.

The graphic arts industry consists mainly of printers who are only partially involved in photoprocessing. In most cases, photography represents a small part of their business and does not present their most pressing environmental problems.[8] These businesses serve an industrial market through published documents and advertising. The amateur photography sector includes all amateur photographic processing, whether at minilabs, large wholesale laboratories, or mail order processing labs. These labs serve individuals taking pictures to preserve memories. These consumers are concerned only about the final picture, not about the process that produces it.

Industry participants stress the variations among the demands of the three major market segments -- medical imaging, graphic arts, and amateur photography. These requirements affect the constraints on process and product improvements.

- The graphic arts market requires high quality pictures, but is relatively unconcerned with processing speed.

- The amateur market tends to be more concerned with speed in processing, but demands increasingly higher quality.

- The medical market is concerned with rapid and accurate diagnosis, and therefore requires both quality and speed, as well as longevity of the image.

According to industry participants, the compliance burdens faced by the photoprocessors make the environmental characteristics of products and processes an important competitive factor in the industry. In Phase 2, we will further investigate the extent to which consumer demands act as a barrier to environmental improvements.

Photoprocessors compete based on price, quality, convenience, and speed of processing. The trends in demand for amateur photographs are somewhat cyclic and follow the economic cycles, with a minimum customer base below which demand will not fall. When people become more price sensitive, as in a recession, they are more willing to sacrifice convenience and speed for lower prices. Furthermore, in recessionary times, vacations and other leisure activities tend to decline, eliminating many picture-taking opportunities.

Commercial photography in the graphic arts industry tends to be even more closely linked to the economy, as much of this industry is based on advertising and business expenditures. Applications in the medical field are for x-ray technology, and are therefore driven by the health care market.

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[8] Printers are usually more concerned about hazardous inks and air emissions from solvents involved in the printing process than about the wastes generated in photoprocessing.

Current Economic Status

The photoimaging industry is continuing through a decade-long restructuring and streamlining process. Manufacturers have been laying off workers, spinning off secondary businesses, and forming alliances with other companies to pursue new markets and add expertise in digital technologies.[9] The value of shipments for SIC 3861 products as a whole has shown a decline since 1991 in constant dollar terms. U.S. photoprocessing sales decreased three percent in 1992, despite modest growth in photoprocessing worldwide. These recent trends reflect the effects of the recession, both on amateur sales (with reduced travel and leisure activity spending) and on graphic arts (which follows overall business trends).

Since the 1950s, there has been substantial growth in amateur photography, due to development of higher quality photographs and the advent of user-friendly cameras. However, the real price of film and materials has fallen or remained constant over the same time period, mainly as a result of product and process improvements, as well as increasing price competition.

In photoprocessing, there was rapid growth in the number of minilabs in the 1980s. This growth has ended recently, except for an increased number of minilabs in mass merchandising and discount stores.

Consolidation is occurring in the industry, both from a manufacturing perspective and from a processing perspective. Some smaller manufacturers have been absorbed by the large market players. In addition, some manufacturers are now involved in processing. Kodak owns approximately half of Qualex, Incorporated, which is the largest single photoprocessing company. Fuji and Konica have also purchased photoprocessing labs. As a result, the three largest manufacturers are now also full or partial owners of the three largest photoprocessing chains. (We do not know what portion of the photoprocessing market these three players serve.)

Products and Processes

Photography is currently dominated by silver-halide processes -- silver being the image-capturing component of film. Within this market, manufacturers have made continuous improvements, including film with sharper colors, finer grain, and a greater variety of speeds; and point-and-shoot and single-use cameras. There are, however, some innovations in products and processes that may reduce the importance of silver-halide products in the future. Most notable is electronic imaging.

The role of electronic imaging is becoming increasingly important in the photographic industry and represents an important area of potential growth. Many of the major photographic manufacturers are planning to add electronic imaging to their product lines. Although the extent to which this will affect the market for silver-halide-based materials is unclear,[10] silver-halide imaging is likely to maintain a significant

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[9] U.S. Department of Commerce, U.S. Industrial Outlook 1994, p. 23-1. Total employment for SIC 3861 as a whole decreased from 88,000 in 1987 to 76,500 in 1991, and to an estimated 75,500 in 1993. A further decline to 75,000 is forecast by the Department of Commerce for 1994.

[10] The production of electronic images is not a chemical process, though chemicals are used in manufacturing the equipment.

market share due to the inferior quality of electronic imaging. The most likely area of growth in the near future is in hybrid systems, which combine the image-manipulating capabilities of electronic imaging with the imaging quality of silver-halide-based output.

Manufacturers have also been developing films without silver halide, mainly because of the high price of silver and the regulations affecting it. Xerox recently developed a heat-based film, which uses selenium rather than silver. Diazo, vesicular, photopolymer, and electrostatic films also are undergoing development and improvement. The success of these alternatives depends on how well they meet consumers' demands as disadvantages associated with substitutes can outweigh the benefits of eliminating silver. For example, alternatives to silver-halide-based x-ray films require that people receive higher exposures to radiation.

Another significant development in the industry has been the single-use camera, which has been purchased by 20 percent of U.S. households. Last year, sales increased 60 percent, with an estimated 20 million units sold world-wide in 1992. Currently, single-use cameras account for approximately 10 percent of the 1.8 billion rolls of film sold annually world-wide.

Environmental Issues

The photographic manufacturing industry is a significant contributor of releases according to the Toxics Release Inventory. In 1990, the industry emitted a total of 37,394,766 pounds of TRI chemicals. Eighty percent of these toxics were emitted to the air. The other media for TRI emissions, in order of decreasing volume, were water and publicly owned treatment works (POTWs); land and underground applications; and offsite transfers.

The industry's primary production emissions are volatile organic compounds from solvent vapors. According to TRI, the largest component of these releases is methylene chloride, which represented 25 percent of the industry's total releases in 1990. Together, five solvents (methylene chloride, methanol, acetone, toluene, and methyl ethyl ketone) accounted for 80 percent of 1990 TRI emissions.

Outside of the industry's solvent use, several toxic inputs to the manufacturing process have typically been the target of environmental concerns. These include:

- silver,
- hydroquinone,
- chromium, and
- selenium (in Xerox's heat-based film).

Over the past 20 years, the industry has significantly reduced the content of silver in their products. The vast majority of silver in film is not used in the image and is recovered from processing solutions. However, the nature of the image formed determines the amount of silver used in that image; quality requirements for image and consistency limit the potential for further reduction.

As a result of the reduction in the silver content in film, the industry has also reduced the amount of hydroquinone in developer. There is a direct relationship between the amount of silver on the film base and the amount of hydroquinone required to develop the image. The amount of chromium used in the film emulsion has also been substantially reduced, and is currently used only in the Kodachrome process. The elimination of chromium in traditional films was primarily the result of regulatory demands on processors to eliminate it from their effluent. In contrast, the concern about selenium has arisen only recently with Xerox's development of a heat-based film which contains the chemical. Although Xerox is promoting the film on the basis of its silver-free nature, many in the industry claim that selenium is far more toxic than silver, and that from an environmental perspective, the new technology represents a step backward.

The industry generates solid and hazardous waste during the production process, including plastic from film cuttings and cartridges, silver, and various solvents. For example, emulsion coating rejects generated during the coating phase contain silver, and are therefore considered hazardous waste. The majority of these materials are recovered, the silver is removed, and the material recycled.

Solid waste has also become a concern for photographic manufacturers, particularly with respect to the single-use camera. Environmentalists have opposed the product based on its disposability. In response, manufacturers have established an infrastructure for recycling the camera, compensating the processors for each camera returned (generally five cents) and for the shipping charges.[11] They have also increased the recyclability of the materials used. Many of the camera's parts, such as the lens, are reused numerous times prior to being recycled. In addition, manufacturers have established recycling programs for other industry by-products. For example, photoprocessors can return film cartridges, spools and returnable chemical drums to the manufacturer for recycling.

Environmental and technical innovations are sometimes developed by the manufacturers in response to their customers' needs. At least partially in response to regulations faced by customers, chemicals in processing solutions and materials have been reduced overall by 30 to 50 percent in the last ten years. Chemistry replenishment rates have fallen, and the manufacturers are improving recyclable processing solutions. These environmental improvements, particularly with respect to the reduction in silver content, have produced positive economic returns. Industry members point out that source reduction generally produces at least some financial benefit.

Photoprocessing operations generate four types of wastes:

- silver-bearing fix solutions and wastewater;
- chemical recovery cartridges (CRCs) used to recover silver;
- film chips containing silver; and
- ferrocyanide sludge.

[11] The 1994 U.S. Industrial Outlook reports that most larger photo processing labs and more than one-half of all minilabs participate in recycling programs for single-use cameras (p. 23-2).

The wastewater from photoprocessing operations has been a focus of regulation because of a number of parameters, including toxic metals, toxic chemicals, oxygen demand, ammonia, and bio-nutrients. By far the largest environmental concern cited by the industry is silver. Close to one hundred percent of the silver in film and paper is removed during color processing, while 40 to 60 percent is removed from black and white film and paper. The amount of silver remaining in the wash water is significant, and many photoprocessing operations have installed equipment designed to recover silver from spent solutions and wash water. The types of silver recovery equipment, in order of usage, are listed in Exhibit 3.3-5.

Exhibit 3.3-5

SILVER RECOVERY EQUIPMENT

Technology	Effectiveness	Advantages	Disadvantages
Electrolytic	Removes 90 percent from silver-rich solutions	No additional chemicals released; Equipment reusable	Will not reach extremely low concentration limits
Metallic Replacement	Removes 90 percent from silver-rich solutions	95 percent removal with two cartridges	Efficiency diminishes with use; Iron in effluent
Ion Exchange Systems	Removes 90 percent from wash waters		Can not be used for spent fix and bleach-fix solutions; Costly; Complicated technical requirements; Adverse environmental impacts
Chemical Precipitation	Removes 99 percent from wash waters		Can not be used for spent fix and bleach-fix solutions; Costly; Complicated technical requirements; Requires hazardous chemicals
Reverse Osmosis		Reduces water volume	Requires additional recovery
Evaporation and Distillation	Concentrates silver-rich solution 40-60 percent	Reduces water volume	Requires additional recovery

Exhibit 3.3-6 provides data on the current use of environmental controls by commercial photoprocessors. Similar data are not available for hospitals and other non-commercial processors.

Exhibit 3.3-6

COMMERCIAL PHOTOFINISHER ENVIRONMENTAL CONTROLS (1991)

	All Specialty Retailers Combined	**Camera Store with Minilab**	**Stand-Alone Minilab**	**Mail Order, Wholesale, and Captive Labs**	**Portrait Studio Firms**
Percent Operating Silver Recovery Systems		96.3%	89.5%	100.0%	66.7%
Type of Silver Recovery Systems Used:					
. electrolytic recovery	80.7%	82.6%	81.0%	94.7%	63.2%
. steel-wool canister	45.8%	48.9%	43.9%	57.9%	36.8%
. ion exchange	3.6%	0.9%	6.3%	20.8%	2.0%
. evaporation/distillation	2.4%	0.9%	0.3%	8.3%	4.1%
Percent that Recycle Water	7.8%	10.2%	7.2%	40.9%	10.0%
Percent that Regenerate Chemistry	25.8%	19.6%	28.6%	86.4%	22.6%
Percent of Firms Visited or Contacted by State or Local Water Authority in 1991		13.1%	25.4%	73.3%	25.0%

Source: 1991-1992 PMA Industry Trends Report, pp. 69-70.

3.3.2 Drivers and Barriers

A wide range of factors was identified in the interviews and expert panel meetings as influencing environmental performance in the photoimaging industry. In some cases, these factors were explicitly identified as encouraging environmental improvements or as posing barriers to compliance or environmental progress. In other cases, a diagnosis of causes was implicit in participants' arguments for various policy solutions, but was not explicitly stated. Of necessity, we have had to interpret the implications of various comments. The reader should keep in mind that not all parties participating would necessarily agree with our interpretations. In general, however, we found substantial agreement about the major environmental issues in this industry among the parties consulted so far (although not necessarily about what policy responses to those issues are appropriate).

As described in Chapter 2, our goal is to determine what factors act as incentives to improve environmental performance (drivers) and what factors act as barriers or disincentives to improving environmental performance. Currently, environmental improvements are largely, though not exclusively, driven by federal and state regulation in the photographic industry, as in most industrial sectors. Much of the discussion in interviews and panel meetings concerned the merits or drawbacks of specific regulations.

Given the substantial effort required to comply with existing and new regulations, it is not surprising that many participants in this study were most interested in talking about the regulatory system and improvements to it. This focus on regulation is only part of the broad range of issues we hope to address in this study, however. To maintain this broad focus, we have supplemented the issues raised by various participants in some cases, to suggest issues that lie outside the interests of these participants or that might take on more importance once specific regulatory concerns are addressed.

To the extent possible, we have noted the specific effect each barrier or driver has on environmental performance in the photoimaging industry. Some of the issues cited as barriers affect the costs of achieving compliance with regulations or improved performance, rather than the extent to which such improvements occur. Reducing these barriers would not necessarily promote additional improvements in environmental performance, but would reduce the costs of existing practices. We included these issues in our discussion of barriers for three reasons:

- First, high compliance costs can reduce compliance, and make regulations less effective in practice. Reducing unnecessary costs may encourage increased compliance, with the attendant environmental benefits and savings in enforcement efforts.

- Second, one of the general goals of the sustainable development concept is to reduce the conflict between environmental and economic goals. One step in that effort is to ensure that regulations are as cost-effective as possible. This project therefore includes efforts to achieve equal or better environmental performance at less cost.

- Third, many of the manufacturers stated that they have a fixed research and development budget for environmental performance, including compliance expenditures. If the cost of compliance were lower, these funds could be diverted to innovative environmental improvements.

We discuss economic, technology, and regulatory drivers and barriers in separate sections below.

Economics

The economic characteristics of this industry have presented both incentives for and barriers to improved environmental performance, according to our discussions to date.

A major barrier to the effective recovery of silver in photoprocessing wastes is the small size and lack of technical sophistication of many of the photoprocessors. Processes to remove silver from wastes require careful operation and maintenance to achieve their design effectiveness. Many photoprocessors, especially the minilabs within drug stores, grocery stores, and department stores, do not have staff with sufficient training and longevity to operate this equipment effectively. While manufacturers make substantial investments in training and guidance, there may be inherent limits in the ability of these processors to operate silver recovery systems effectively.

High prices for certain inputs have encouraged reduced use of those inputs over time. In addition, competition based on product quality has encouraged some environmental improvements. This congruence between economic and environmental goals was particularly noted with respect to silver. Past increases in the price of silver encouraged efforts both to reduce the amount of silver used in sensitized products and to increase silver recovery and recycling.[12] The extent to which silver is recycled is sensitive to price, and according to industry participants is currently hampered by the combination of moderate prices for silver and the costs of complying with RCRA rules.[13] However, actions taken to reduce the amount of silver in sensitized products also had the effect of improving product quality.[14] According to industry contacts, competition based on product quality has continued to encourage the use of less silver over time, independent of fluctuations in the price of silver.

The high costs of replacing in-place photoprocessing equipment acts as an economic barrier to improved environmental performance. Many environmental improvements (e.g., processes that recycle photoprocessing chemicals) are embedded in the photoprocessing equipment, and replacement of existing equipment is required to achieve those improvements.[15] Photoprocessors are reluctant to replace equipment before the end of its useful life -- especially minilabs, for whom the capital investment can be a substantial burden. While the equipment replacement cycle acts as some constraint on the speed of environmental improvements, it is not clear that it causes significant delays. The basic pace of product and process improvement results in a turnover of photoprocessing equipment in only eight years on average, according to industry experts.

Photographic product users' needs are also cited by industry contacts as a factor influencing the pace and extent of environmental improvements. As described earlier, different end-use segments present different demands that influence the nature of changes in photoprocessing chemistry over time. For example, the market demand for one-hour processing eliminates many opportunities for reducing the chemical content of processing chemicals. If chemicals are reduced, the film must remain in the solution longer, extending the time required for developing. Also, the accuracy and quality requirements of x-ray film and graphic arts film limit the potential for alternatives to silver-halide-based film.

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[12] Incentives to conserve and recover silver were especially strong in 1980 when the Hunt Brothers' attempt to corner the market in silver drove prices up to about $50 per troy ounce. Silver prices declined dramatically after this episode, and are now approximately $5.15 per troy ounce.

[13] The impact of RCRA on incentives to recycle is discussed later in this section.

[14] Using fewer and thinner emulsion layers produces a sharper image, as well as reduces the amount of silver and other chemicals used.

[15] For example, the Rapid Access color developing process requires less water and less chemicals, and takes up less space than its predecessor. RA processing is also faster, allowing for one-hour film developing.

Finally, competition from foreign suppliers is cited as a factor influencing manufacturers' ability to absorb the costs of environmental compliance. The industry is becoming increasingly international in nature as the trade environment changes and foreign companies begin manufacturing in the United States. According to the industry, foreign competitors often face less stringent or more cost effective environmental regulations than those with which U.S. companies must comply. To the extent that production by foreign companies in the United States increases, this cost advantage will narrow. We do not currently know how much of a cost advantage foreign suppliers actually enjoy, or what the future mix of U.S. versus overseas production is likely to be.

Technology

The nature of photographic equipment requires that the supplies be relatively interchangeable. According to industry experts, there are quality differences among products and photoprocessing processes. However, within product categories (e.g., 35 mm films) there must be enough consistency in design for products to be used in a range of equipment. Similarly, the processing chemistries must be consistent to allow development of all brands of film. This results in a strong incentive for coordination with regard to technical standards. These technical standards may either promote or hinder environmental improvements, depending on how they are defined. More investigation would be needed to determine whether existing standards act as barriers or as drivers.

Regulations

Regulation has acted both as an incentive to environmental improvements in photographic products and processes and, according to industry participants, as a hindrance. Clearly, the regulation and high price of silver have encouraged actions to reduce and recover silver in photoimaging. However, industry representatives argue that:

- The current standards governing silver under the Clean Water Act (CWA) and the Resource Conservation and Recovery Act (RCRA) are not justified by the scientific evidence on the human health and environmental impacts of silver.

- States and localities have in some cases gone well beyond the standards set at the federal level, to impose stringent limits on silver in indirect discharges to POTWs that (1) are extremely expensive to meet, (2) may encourage increased discharge of other toxic chemicals, and (3) discourage water conservation.

- Regulation of silver-bearing wastes under RCRA discourages recycling of silver.

The Silver Coalition has requested that EPA acknowledge certain facts and take action as follows:

- "... the ionic form of silver, rather than total silver, in waste water discharges is the substance that should be regulated.

- ... during an interim period, water quality criteria for silver [should] be established that is 40 times the current or proposed acute and chronic values that are based on the toxicity of free silver ion (Ag^+).

- o ... a reasonable time [should] be established for the development of an analytical method to measure the ionic form of silver at very low levels.

- o ... silver [should] be deleted from the Toxicity Characteristic (TC) list under RCRA ... consistent with the action of the Office of Drinking Water, which deleted the primary maximum contaminant level (MCL) for silver, and our understanding of other pathways."[16]

Issues related to the CWA and RCRA are discussed separately below.

Clean Water Act

For the purposes of the Clean Water Act, there are two types of dischargers of aqueous waste -- those who discharge directly to surface waters and those who discharge indirectly, through the sewer lines and eventually to a POTW. Direct dischargers, including the POTW itself, are regulated under National Pollutant Discharge Elimination System (NPDES) permits. The limits in these permits are based (for some industries) on national effluent guidelines, and for all dischargers on Federal Water Quality Standards and, if required, more stringent standards specific to the receiving water body.

POTWs establish pretreatment standards for indirect dischargers in their service areas to ensure that after treatment the POTW's effluent will meet its NPDES permit limits and to prevent disruption of its treatment processes. The pretreatment limits are specified in a pretreatment permit issued to the source. In most cases, these are the limits that apply to photoprocessing operations, since more than 90 percent of photoprocessors are indirect rather than direct dischargers.

The main Clean Water Act constituent of concern for the photographic industry is silver. In the 1970s, EPA stated in guidance that photoprocessors should not be regulated as a categorical industry, because they were already recovering silver due to its economic value. The Agency was concerned about promoting water conservation and reducing the hydraulic loading to the treatment plants.

Prior to 1990, the drinking water standard for silver was 50 parts per billion, which was not problematic for either the manufacturers or the processors. This acute criterion was based on hardness, and there were no chronic criteria for silver, as the acute standard was believed to be adequately protective of human and aquatic health. In 1990, EPA proposed chronic criteria for silver in the Draft Silver Criteria Document. This document proposed removing the hardness-based standard and suggested that fresh water chronic criteria be based on the lowest observed effect level (LOEL). Shortly thereafter, the National Toxics Rule and the Great Lakes Water Quality Initiative also proposed numeric chronic silver criteria.

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[16] Letter from Thomas J. Dufficy, NAPM, to Richard D. Morgenstern, U.S. EPA, dated June 25, 1992, accompanying a Silver Coalition report on "An Economic Assessment of the Impact Resulting from Silver Pretreatment Standards."

Although EPA determined that the Draft document should not be finalized and that the numeric chronic criteria should be removed from both the National Toxics Rule and the Great Lakes Initiative, twenty-four states had already adopted the chronic criteria and used them to establish silver discharge limits for treatment plants. The POTWs then established pretreatment limits for industrial dischargers based on these standards.

Several states eventually followed the EPA guidelines. Arizona, Georgia, and Pennsylvania have deleted the chronic criteria for silver. Missouri and New Mexico have proposed that the state delete the standard, and the chronic standard is under review in Colorado, Florida, Mississippi, New York, Oklahoma, Rhode Island, and Texas.

In 1992, the Office of Science and Technology at EPA issued a memo to the Regions recommending that states not adopt chronic water quality standards for silver. The 1993 National Toxics Rule contained only acute water quality standards for silver.

Industry representatives argue that the effective limit on silver established for many photoprocessors is too stringent. A number of factors contribute to the low effective standards imposed in many locations:

- The federal water quality standard is based on the toxicity of ionic silver. Industry argues that silver discharged from photoprocessors in the form of silver thiosulfate rapidly combines with other naturally occurring substances to form compounds that are much less toxic than ionic silver.[17]

- There are no reliable analytic procedures to test for ionic silver, so that monitoring and compliance are generally based on total recoverable silver. Some studies show that much of this silver may not be biologically available, and that the amount of the most toxic ionic silver present is quite low.[18]

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[17] The federal concentration limit for silver in aqueous effluent is 5 parts of silver per million parts of water. This limit is based on tests performed with silver nitrate in laboratory test water, which decomposes to ionic silver.

[18] In October 1993, EPA's Office of Water Policy issued Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria, recommending that dissolved metals concentrations, rather than total recoverable metals concentrations, be used to set and measure state water quality standards. However, the majority of states and POTWs continue to set limits based on the risk posed by ionic silver, and to require monitoring and measurement based on total recoverable silver.

- o Limits on indirect dischargers are based on an allocation model used by the POTW. Some commenters argue that the limits imposed on photoprocessors are lower because limits cannot be imposed on households and other non-photo sources that are difficult to control.[19]

Industry representatives argue that the extremely low silver limits applied in some localities impose high costs that are not justified by the environmental benefits, and result in increased discharges of other toxic compounds.

- o In some areas, the limits are so low as to preclude discharge of any kind, and processors must have their solution hauled off-site. The cost of having spent, silver-rich solutions hauled off-site for recovery typically runs between $2.00 and $6.00 per gallon within a 25-mile radius of the central facility.

- o The implementation of extremely low concentration limits for silver requires processors to use more advanced recovery techniques. One of these is ion exchange, which, according to industry requires the use of sulfuric acid and sodium hydroxide, both of which are extremely toxic. The use of these chemicals results in the processors' being regulated under Title III of the Emergency Planning and Community Right to Know Act (EPCRA).

- o Another option for reaching very low concentration limits is metallic replacement with several cartridges. These cartridges deposit iron in the effluent. According to the industry, to reach very low limits, the cartridges must be replaced at 20 to 40 percent capacity, rather than the 80 percent capacity typically recommended by manufacturers. This results in more cartridges being used, more iron in the effluent, and more frequent transportation of the cartridges to silver recyclers.

Industry representatives also stated that regulation of silver in wastewater discharges may discourage water conservation.[20] Because most pretreatment permit limits are expressed on a concentration rather than mass basis, they argue that photoprocessors are discouraged from adopting water-saving measures. For example, use of concentration-based limits is said to discourage photoprocessors from adopting "washless" technologies or otherwise reducing water use (e.g., by increasing the number of stabilization tanks and using countercurrent rinsing). One source even described situations in which photoprocessors that were not able

[19] It has been estimated that large photoprocessors such as hospitals, diagnostic clinics, motion picture film developers, and large printers and photofinishers account for approximately 10 to 25 percent of silver loadings to POTWs. Small photoprocessors account for another 25 to 50 percent. A large portion of the remainder comes from domestic sources -- e.g., from washing of silverware.

[20] One source stated that reducing water use is the area with the greatest potential for environmental improvement in this industry.

to meet very low local limits were encouraged by regulators to increase their water discharges to meet their concentration limit through dilution.

The CWA regulations allow the use of either mass-based or concentration-based limits. Presumably, a concentration-based limit could be changed if flow were to change, to achieve the same limit on mass loadings. However, various parties argued that POTWs are reluctant to use mass-based limits for indirect dischargers, or to adjust concentration-based limits to encourage water conservation. A variety of reasons were cited for this reluctance, including:

- Greater inherent difficulty in monitoring mass-based limits;
- Lack of familiarity with mass-based limits on the part of POTWs and/or the states who oversee the POTWs' compliance with their own permits;
- Concern on the part of POTWs that they will have compliance problems and be subject to state enforcement actions if they attempt to make changes to their current systems; and
- Current use of computer databases and monitoring systems set up to track concentration limits, that would require software changes if mass-based limits were used instead.

More investigation would be needed to understand the relative importance of different barriers to the use of mass-based limits (or more flexible application of concentration-based limits) to encourage water conservation.

Industry representatives acknowledge that current evidence on the fate and transport of silver in the environment is not adequate, and industry participants are currently sponsoring a number of scientific studies in cooperation with EPA. A POTW representative on the expert panel urged EPA and the photographic industry representatives to include studies of the fate of silver in the sewers, while a representative of the Natural Resources Defense Counsel expressed concern that further studies be conducted to account for possible cumulative biological effects.

Resource Conservation and Recovery Act (RCRA)

Wastes containing silver are regulated as hazardous under Subtitle C of RCRA if they exhibit the toxicity characteristic for silver.[21] However, the Subtitle C requirements that apply to these and other "precious metals" wastes when they are recycled are less stringent than the requirements that apply to other hazardous wastes. In addition, generators of hazardous wastes in quantities less than 100 kg/month (including all their hazardous wastes) are largely exempt from the Subtitle C requirements.[22] Virtually all photoprocessors except individual doctors' and dentists' offices and some very small minilabs are likely to generate wastes exceeding the Small Quantity Generator (SQG) limit.

According to industry participants, the regulatory status of different forms of silver-bearing materials varies, and there is some confusion about what materials are potentially subject to regulation as hazardous wastes. In general, industry contacts said that:

- Rinsing electrolytic flake generates a hazardous wastewater.
- The electrolytic flake itself is considered a product and not subject to regulation.
- The silver-saver cartridge from metallic replacement recovery is not a hazardous waste if it is properly rinsed and does not exhibit the toxicity characteristic for silver.

The following requirements apply to silver-bearing wastes sent off-site for treatment:

- Generators must notify EPA that they are generating a hazardous waste and obtain an EPA ID number.

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[21] The toxicity characteristic (TC) is one part of the "definition of hazardous waste" (40 CFR 261), and silver is one of 40 toxic chemicals currently included in the TC. Wastes exhibit the characteristic for silver if they generate a leachate that contains more than 5.0 mg/liter of silver. The regulation specifies the test procedure to be used to generate the leachate from the waste (the Toxicity Characteristic Leaching Procedure or TCLP) and analytical methods for testing for silver. For liquid wastes (e.g., wastewaters), the waste itself, rather than a leachate from the waste, is subject to the silver concentration characteristic. Generators of wastes are not required to actually analyze the waste or leachate for concentration levels. They must "determine" whether the waste exhibits the characteristic by testing or by applying their knowledge of the processes generating the waste.

[22] These "small quantity generators" (SQGs) must send their wastes only to facilities that are regulated as Treatment, Storage and Disposal Facilities (TSDFs), that are authorized by the State to handle such wastes, or that recycle the wastes. There are limits on the amount of waste SQGs may accumulate without losing their exemption. Off-site facilities that receive wastes only from SQGs are also exempt from the RCRA requirements. It is unlikely, however, that any off-site silver recyclers handle only wastes from SQGs.

- o Wastes must be transported using licensed hazardous waste carriers, which adds to the cost of transportation.

- o Generators and transporters must comply with Department of Transportation rules for transportation of hazardous materials.

- o Generators must prepare a manifest for each shipment, maintain records, and submit "exception reports" if not notified that wastes are received at the intended destination; transporters and the receiving facilities must comply with the tracking requirements of the manifest system.

- o Generators must keep certain records and submit a "Biennial Report."

- o Transporters are required to clean up and mitigate any releases of the wastes during transport.[23]

- o Storage of the wastes prior to shipment off-site is limited to 90 days before the storer becomes subject to extensive TSDF requirements. Such "short-term" storage (less than 90 days) is subject to contingency planning, preparedness and prevention, and personnel training requirements. In addition, storage must be in containers or tanks that meet certain technical requirements.

In addition, the central treatment facility receiving the wastes is subject to an extensive set of requirements for "Treatment, Storage, and Disposal Facilities" (TSDFs).

Generators of silver-bearing wastes destined for recycling, and facilities that recycle these wastes, are exempt from most of the requirements that apply to wastes that are treated or disposed.[24] Generators must notify EPA and obtain an ID number, and generators, transporters and recycling facilities must comply with

[23] Under Department of Transportation rules for hazardous materials transport, transporters are required to report spills and releases but not necessarily to clean up or mitigate the damages.

[24] Only "spent materials" are subject to requirements when reclaimed. Other types of silver-bearing wastes ("sludges" and "by-products") are not regulated as hazardous under RCRA when recycled. "Sludges" are defined as solid, semi-solid, or liquid wastes generated by water treatment or air pollution controls. In the case of photoprocessing, wastewater treatment residuals are not subject to the precious metals recycling requirements when recycled, but other silver-bearing wastes may be regulated when recycled (e.g., spent processing solutions). In addition, silver-bearing wastes that are regulated when reclaimed are subject to the reduced requirements for "Resource Materials Utilized for Precious Metal Recovery" in 40 CFR 266 Subpart F, rather than the more extensive requirements that apply to other hazardous wastes.

the manifest requirements. Recyclers must keep records to show that sufficient amounts of the material are being recycled.[25]

[25] That is, they must demonstrate that the materials are not being "accumulated speculatively" rather than being recycled.

Regulation of silver-bearing wastes under RCRA subjects more of these wastes to the Department of Transportation hazardous materials transportation requirements than would otherwise be regulated. The DOT rules include a variety of packaging, placarding, and transport practice requirements that depend on the mode of transport and the type of hazard posed by the waste. The DOT hazardous materials requirements apply automatically to any waste that is subject to the RCRA hazardous waste manifest. If silver-bearing wastes were not subject to the RCRA manifest requirement, they would be subject to the DOT rules only if they contained the specific forms of silver listed in the DOT hazardous materials table and if shipped in quantities exceeding their "Reportable Quantities." In addition, transporters would not have to comply with Subtitle C storage facility requirements if they stored the wastes for more than 10 days in transit, and would not automatically have to clean up or mitigate spills during transport. The effect of regulation under RCRA, then, is to apply the DOT requirements to a larger set of silver-bearing wastes and to impose some additional requirements on generators and transporters.

Wastes discharged to the sewers or under a NPDES permit are not subject to any RCRA requirements, unless they are stored prior to discharge. Wastewater treatment tanks used to treat wastes prior to discharge are also exempt from RCRA TSDF requirements. Therefore, photoprocessors can avoid RCRA regulation by treating and discharging their wastes in compliance with Clean Water Act requirements.

Industry participants argue that regulation of silver-bearing wastes as hazardous -- even with the reduced requirements for wastes that are recycled for precious metals -- discourages recycling. They cite the example of silver-coated plastic film, which is generally chemically treated or burned for silver recovery, since it has sufficient economic value to be worth recycling. In contrast, other than spent fix and bleach-fix, photoprocessing solutions do not generally contain enough silver to be recycled economically, given the costs imposed by hazardous waste regulations. Packaging and transportation under DOT rules, using a licensed transporter, and complying with the manifest requirements are the main sources of added cost.

In addition, some industry participants expressed concern about additional liability for the wastes sent off-site, due to their definition as hazardous under RCRA. This concern may arise from the added transporter responsibility to clean up spills imposed by RCRA, or may refer to added liability under the Superfund program. Technically, definition of a waste as hazardous has no direct bearing on a generator's liability for clean-up costs if the wastes end up at a Superfund site. In practice, however, the generator may be more liable for wastes regulated as hazardous, because the wastes can be more easily traced to their source due to the RCRA manifest and labeling requirements.

RCRA regulation also discourages the development of centralized treatment facilities, other than POTWs. Photoprocessors are subject to the requirements for short-term storage if they store wastes prior to shipment off-site for treatment rather than recycling -- and to more extensive storage facility requirements if they store for more than 90 days. The centralized treatment facility itself would be subject to permitting and to the full Subtitle C requirements for treatment and storage facilities. Absent such regulation, shipping wastes to centralized facilities for treatment might be more economical and more effective in reducing risks than treatment on-site -- especially for the smaller processors that lack the skills, space, and capital to treat wastes extensively. For example, industry representatives said that small processors might send their wastes for treatment in more cost-effective equipment at larger processors' facilities. More investigation would be needed, however, to determine under what circumstances centralized treatment would be more effective and less costly.

Industry representatives said that some states define recovery of silver or silver-bearing wastes in the on-site process as treatment, subjecting the processors themselves to the TSDF standards. Further investigation is needed to determine the basis for this regulation. The minimum national standards established by RCRA exempt "totally enclosed treatment units" from regulation as TSDFs. Some states may have applied more stringent standards, or there may be disagreements about whether photoprocessing processes qualify as totally enclosed treatment units.

In general, then, industry representatives argue that regulation of silver-bearing wastes as hazardous under RCRA encourages the discharge of wastes to POTWs and discourages recycling. This results in added loadings to POTWs, especially from small dischargers that are unlikely to be subject to POTW and local enforcement scrutiny. Larger photoprocessors, who are subject to more scrutiny and more effective enforcement of pretreatment requirements, incur higher costs overall because the costs of recycling, centralized treatment, and in some cases on-site recovery of silver are inflated by the RCRA requirements.

The Silver Coalition is seeking removal of silver from the RCRA Toxicity Characteristic (TC) list. Silver was originally placed on the TC list when it was initially promulgated, because the TC included all toxic chemicals for which there were primary MCLs in effect. Because the primary MCL for silver has been deleted, the Silver Coalition argues that silver should be removed from the TC as well. EPA's Office of Solid Waste is considering this request. The OSW representative on the second expert panel agreed that removal of silver from the MCL is sufficient evidence that silver should not be included on the TC based on human health effects. Removal from the TC will therefore depend on OSW's review of the ecological effects of silver. At this time, however, OSW is not actively studying this issue and removal of silver from the TC is low on the Office's priority list due to lack of resources.[26]

3.3.3 <u>Possible Policy Options</u>

Our research and discussions with various stakeholders suggested a number of policy options EPA or other parties might take to promote improved environmental performance in the photoimaging industry. Exhibit 3.3-1 provides a list of the ideas that were raised by one or more participants, or suggested by our research on the industry. The ideas range from specific regulatory reforms, to education or outreach programs to promote compliance or improved practices, to cooperative research projects.

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[26] It was estimated that even a rule-making that is not controversial would take one full-time staff person and one-and-one-half years to complete.

Exhibit 3.3-1

POSSIBLE POLICY OPTIONS: INITIAL LIST

- o EPA Will Provide Training and Flexibility for the Use of Mass-Based Limits by POTWs
- o Modify Hazardous Definition of Silver
  1) Flexible Regulation Under Subtitle C
  2) Apply the Special Collection Rule
  3) Take Silver off the Toxicity Characteristic List
- o Regulate Photoprocessors under a Code of Management Practice for Water Effluent and Silver Recovery
- o Make Federal/State/Local Effluent Guidelines Consistent
- o Monitor for Ionic Silver or Change Pretreatment Limits to Address Total Recoverable Silver
- o Standardize the Permit Application Procedure for Minilabs
- o EPA Participation in Voluntary Standard-Setting Process
- o Develop Institutional Knowledge Base at EPA
- o Develop Life-Cycle Analysis Techniques
- o Recognize Positive Environmental Performance
- o Facilitate Cooperation Among Manufacturers on Recycling Programs

This list was discussed at the second expert panel meeting, and revised to reflect their comments and additions. At that meeting, participants selected four areas for focus in Phase 2 of the project:

- o Removing RCRA Barriers to Centralized Treatment and Recycling of Silver;
- o Developing and Promoting a Code of Management Practices for Photoprocessors;
- o Continued research on Silver Speciation, Toxicity, Fate and Transport in the Environment, and Development of Analytical Methods
- o Minimizing Inconsistencies in Regulation, Standards, and Enforcement Among the Federal, Regional, State and Local Governments.

These four areas are discussed in detail in this section. Appendix 3-B to this chapter provides brief discussions of the policy issues and options that were not selected at that meeting for focus in the next stage of the project. As described in Chapter 1, EPA intends to continue investigating the potential for cooperative pilot projects in the four areas highlighted by the expert panel. Other ideas for policy actions and pilot projects may also be pursued as well, depending on the comments received on this report.

Criteria for Selecting Policy Options

In evaluating policy areas, the expert panel favored options that would:

- o Have a significant environmental payoff;
- o Promote cost-effectiveness;
- o Be "cleaner, cheaper, and smarter";
- o Have the capacity to affect long-term thinking and action toward sustainability;
- o Be feasible, considering the length of time required for completion, the method of implementation, the size of the relevant audience, impact and importance, and the effectiveness of EPA as a player; and
- o Encourage cooperative involvement in the project among a variety of stakeholders.

Removing RCRA Barriers to Centralized Treatment and Recycling of Silver-Bearing Wastes

As noted earlier, the Silver Coalition is seeking removal of silver from the RCRA toxicity characteristic list. They point out that the primary MCL for silver that resulted in inclusion of silver on the TC list in the first place has now been deleted by EPA. They argue, then, that there is no reason for silver to be on the TC list because it is regulated by water quality standards and is immobile in soils, and therefore does not appear to be a potential source of adverse ecological effects.

This action would remove photoprocessors' silver-bearing wastes from any federal regulation as a hazardous waste. Hazardous waste regulations would still apply under other RCRA sections addressing secondary refiners and other specific facilities. The Coalition argues that there would be no increase in risks to human health and the environment, and that this action would promote more recycling of silver, resulting in reduced discharges to POTWs.

Removal of silver from the TC would not automatically result in deregulation of silver wastes in the RCRA-authorized states. However, industry representatives say that they would have additional leverage to persuade the states to modify their regulations and legislation.

Other options short of removing silver from the TC entirely might also reduce barriers to recycling. EPA is currently investigating options for revising the RCRA regulation of recycled wastes. The Definition of Solid Waste Task Force is considering a new regulatory strategy for recycled hazardous wastes, which applies different rules for different types of wastes and recycling practices. New provisions that reduce disincentives to recycling silver-bearing wastes might be considered in that context. In addition, photoprocessing wastes might be subject to reduced requirements under the Special Collection or Universal Waste Rule, which is currently in use for fluorescent light bulbs and batteries.

Industry members of the expert panel expressed less interest in these more limited options than in complete removal of silver from the TC. They noted that reduced federal regulation rather than removal from the TC would be less persuasive to the states as evidence that silver does not require regulation as a hazardous waste.

The industry's on-going research on the ecological effects of silver will clearly be an important step toward a decision by EPA about whether to remove silver from the TC. The second expert panel discussed the fact that the decision might also come more quickly if responsible environmental groups agreed that deregulation of silver wastes is appropriate. As mentioned previously, environmental groups are skeptical and will likely remain so until convinced that there is no potential for silver to bioaccumulate in organisms.

This led to discussion about a possible pilot project to test the hypothesis that removal of silver from the toxicity characteristic list would promote more recycling and reduced discharge to POTWs. Such a cooperative industry-EPA project might involve testing the impact of reduced regulation in a certain geographic area on shipments to recyclers, concentrations of silver in POTW influent, and the extent of on-site recycling. The project might address deregulation of silver wastes by removing silver from the TC list, or other more limited actions to reduce RCRA barriers to recycling as well. The pilot project might also be extended to address the potential for increased centralized treatment and recovery, as well as increased recycling.

Developing and Promoting a Code of Management Practices

The Silver Coalition, the Association of Metropolitan Sewerage Agencies (AMSA), and the Water Environment Federation, among others, are currently in the process of developing a Code of Management Practices for photoprocessors. The Code is based on the Best Available Technology Economically Achievable (BATEA) combined with Best Management Practices (BMPs), and is intended to apply to all sources of photoprocessing waste. According to the industry, development of the Code will proceed, regardless of the Agency's participation. However, the organizations involved encourage EPA to promote its use and adoption, in order to provide an impetus for states and localities to incorporate it into their permitting procedures.

The Code of Management Practices, currently in draft form, would recommend practices that vary with the size of the photoprocessor (defined by daily gallons of process wash water and weekly gallons of silver-rich solution). The practices are defined by a minimum recovery of silver from silver-rich processing solutions (e.g., 90 percent) and alternative combinations of recovery methods that would achieve those recovery rates. Those developing the Code estimate that compliance with the recommendations would reduce silver loadings to POTWs by 25 to 50 percent.

According to industry and POTW representatives, the majority of POTWs do not have the resources to monitor large numbers of small facilities. Industry claims that if the best treatment technologies economically achievable and management practices for operations, maintenance, and testing are identified and implemented, monitoring these facilities will be less resource-intensive.

The authors intend the Code to be as simple as possible, and to ensure flexibility in compliance. It assumes that minilabs will be educated in the appropriate maintenance, operation, and monitoring of the recommended systems. Many labs currently have recovery equipment in place but do not operate it effectively. The photographic supplies manufacturers have agreed to provide this assistance and to distribute the Code. The industry claims that if labs implement the Code in its entirety, the large majority of them will be in compliance with the pretreatment limits established by the POTWs. According to the Silver Coalition, the Code is not intended to be a substitute for regulation. They expect its use to result in higher actual compliance with current standards.

According to the industry, the Code of Management Practices could serve many purposes, including:

(1) Education and technical assistance, to support improved compliance with standards;

(2) Assistance to POTWs and other regulators in understanding silver sources; and

(3) As a condition for regulatory variances or permit approval.[27]

Industry representatives argue that there are sufficient economic incentives to follow the Code of Management Practices, because of the increase in silver recovery. The Code will make it easier for photoprocessors to act on this incentive by providing them with the tools and information they need to do so effectively.

The Code of Management Practices is currently in draft form; there has not yet been agreement among the sponsoring groups on the final document. At this point, we have not fully explored EPA's role in developing and promoting the Code. However, when the Code is complete, the Coalition would like EPA to review it and to publicly endorse it. EPA's support would provide credibility so that states and localities are more likely to accept it. Endorsement by EPA might also relieve processors of enforcement concerns, inducing them to implement the Code.

Agency representatives on the panel expressed interest in endorsing the Code of Management Practices, assuming that approval does not result in any reduction in enforcement authority. They also suggested a pilot project implementing the Code in a particular locality. If measurements demonstrated that the amount of silver recovered rose and the total loadings to the POTW fell with the use of the Code of Management Practices, the Agency (and concerned environmental groups) might support its wide-spread adoption more actively.

It was also suggested that state, county, and local technical assistance groups be included in the distribution of the document. These groups could be helpful in disseminating the information in the Code and in assisting POTWs and processors in interpreting its provisions.

[27] For instance, the Coalition would like POTWs to consider implementation of the Code an effective pretreatment permit if the facility meets the relevant pretreatment standards.

Silver Speciation; Toxicity; Fate and Transport; Methods

Currently, the environmental effects of various forms of silver are not clearly understood. It is not clear how silver speciates in natural environments and in sewer systems, how toxic the various forms of silver are, how the various forms affect biological organisms, or how to test for the many forms of silver. The industry is attempting to resolve these issues, and would like to cooperate with EPA in doing so.

The industry, in cooperation with regulatory agencies, is actively sponsoring research on the fate, transport, and toxicity of silver, in the hope that this research will address regulators' uncertainties about the effects of silver in the environment. The Silver Coalition has been coordinating with the Office of Water in developing this research plan.

The second expert panel encouraged continued cooperation in sponsoring this research to resolve scientific uncertainties about the effects of silver. Industry representatives expressed the hope that EPA will respond quickly to the results of the research, when they are complete, by reducing or adjusting standards where warranted. A representative for the POTWs encouraged industry and the Agency to cooperate in studying the speciation of silver, particularly with regard to its changes in form between release from the processor and arrival at the POTW. The research efforts are ongoing, and at the moment development of sediment criteria is a major focus. Within EPA, there is a research plan to address the toxicity of silver in sediments. The Coalition representatives urged EPA to fund a portion ($30,000) of the cooperative effort.

Industry also asked that the Agency keep them informed of the evidence it needs to address these issues in a regulatory context, so that they can fund appropriate studies. They also suggested that the Agency allocate more travel money to allow their staff, particularly in OW and OSW, to attend industry-sponsored scientific conferences.

Minimize Inconsistencies in Regulation, Standards, and Enforcement

According to the industry, there are many variations in the setting, interpretation, and enforcement of regulations, resulting in competitive disadvantages for processors in some areas. They claim that it is difficult for businesses to predict the actions of regulators, and therefore compliance is problematic. It was frequently noted that some states and localities impose more stringent limits than the federal standards. According to industry representatives, these more stringent limits are not justified by the evidence on the risks posed by silver in the environment.

A number of suggestions were made for EPA policies that might increase the consistency and rationality of the standards imposed on photoprocessors. The most extreme suggestion was that EPA require that states and localities set standards consistent with national standards, unless more stringent standards are specifically justified by local conditions. Some panel members noted that such an intrusion on states' authority would be very unlikely to be adopted. Water quality standards are intended to allow for local variations in water quality and usage. A single standard as proposed by the panel would eliminate this possibility.

Another way that EPA could promote more consistent standards for silver in effluent would be to establish national categorical pretreatment limits for the photoprocessing industry, rather than leaving limits for photoprocessors to be based solely on POTWs' own limits and their allocation to sources.

A third suggestion was for EPA to sponsor education and technical guidance for local regulators on how to establish a logical silver limit based on scientific evidence. This guidance should include information on the risks posed by silver and the conservative assumptions used in setting the federal standards. The guidance might also clarify the economic and environmental effects of extremely stringent concentration standards in effluent guidelines. Those advocating this effort argued that most states would be receptive to guidance from Headquarters if it is presented in a palatable way. The Association of Metropolitan Sewerage Agencies (the trade association for POTWs) should also be involved in this effort.

Industry representatives also suggested that the Agency advocate the use of mass-based limits by the states and localities, to promote water conservation and the use of washless technologies. Although EPA does not have the regulatory authority under current statutes to require that mass-based limits be used, the Agency could issue guidance to states and POTWs regarding the use of mass-based standards. The Agency might also allow temporary exemptions from enforcement for POTWs transferring to mass-based limits. A representative of the Environmental Defense Fund suggested that the environmental community might support such an effort, if the focus were on the use of mass-based limits as a way to promote water conservation.

Industry representatives encouraged the Agency to provide and practice standardized monitoring procedures. Currently, there are a number of uncertainties regarding proper sampling and testing techniques for effluents from photoprocessors. The industry suggested that EPA train regulators about the requirements of various federal regulations, thereby facilitating universal understanding and consistent enforcement.

More specifically, industry members and related parties complained about the inconsistency of the 40 CFR 136. 3 List of Approved Inorganic Test Procedures, number 62 for silver. Representatives from the Office of Water agreed to review the standard.

According to the industry, there are also inconsistencies in analytical laboratory procedures. The expert panel discussed possible development of a system for accrediting analytical labs. EPA participants argued that the Agency lacks the resources to establish an accreditation program for labs, and that the Silver Coalition or an industry trade association might play that role instead. The Photo Marketing Association is currently publishing a document entitled "How to Select an Analytical Lab" to help processors choose reputable testing labs.

Appendix 3-A

BIBLIOGRAPHY FOR THE PHOTOIMAGING INDUSTRY

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BIBLIOGRAPHY FOR THE PHOTOIMAGING INDUSTRY

County Sanitation Districts of Los Angeles County. *Photoprocessing: Pollution Prevention Opportunities Checklist*.

Dufficy, Thomas; Cappel, Robert; Summers, Scott M. "Silver Discharge Regulations Questioned," *Water Environment and Technology*, Vol. 5 No. 4, April 1993.

Dysart, Joe. "Corporate Environmentalism : Green is Decidedly in Fashion," *PTN*, Vol. 56 No. 18, September 21, 1992, pp. 8-9.

"Eye on the Environment," *PTN*, Vol. 57 No. 6. June 15, 1993, pp. 19-20, 23.

Institute for Local Self-Reliance. *Proven Profits from Pollution Prevention - Case Studies in Resource Conservation and Waste Reduction*. Washington, D.C., 1986.

LeBlanc, Gerald A.; Mastone, Joseph D.; Paradice, Arthur P.; Wilson, Brenda F. "The Influence of Speciation on the Toxicity of Silver to Fathead Minnow," *Environmental Technology and Chemistry*, Vol. 3 1984, pp. 37-46

Neubart, Jack. "Product Packaging Becomes Environmentally Friendly," *PTN*, Vol.56 No.18, September 21, 1992, pp. 9, 16.

Neubart, Jack. "Technically Speaking, Today's Color Chemistries are Cleaner and Safer," *PTN*, Vol. 57 No. 6. June 15, 1993, pp. 22, 27.

Photo Business, December 1992, p. 20.

Photo Marketing Association International. *The PMA Industry Trends Report, 1991-1992*. Jackson, Mississippi.

Photofinishing News

Photographic Society of America, Inc. *Perspective World Report 1966-1969 of the Photographic Industries, Technologies, and Science*. Philadelphia. (Note: this organization no longer exists under this name.)

Photography Trade News

Polaroid Report on the Environment 1991.

RMA Annual Statement Studies 1992. Robert Morris Associates, Philadelphia.

Toxic Release Inventory

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(continued)

BIBLIOGRAPHY FOR THE PHOTOIMAGING INDUSTRY

U.S. Department of Commerce, Bureau of the Census. *1987 Census of Manufactures Industry Series - Medical Instruments; Ophthalmic Goods; Photographic Equipment; Clocks, Watches, and Watchcases*. MC87-1-38B. (Note that single establishment companies with up to 20 employees were excluded from the mail portion of the census, and administrative records or industry averages were used to compile the data. These facilities account for 4 percent of the total value of shipments.)

U.S. Department of Commerce, Bureau of the Census. *1987 Census of Manufactures Subject Series: Concentration Ratios in Manufacturing*. MC87-S-6.

U.S. Department of Commerce, Bureau of the Census. *Current Industrial Reports: Pollution Abatement Costs and Expenditures, 1991*. MA200(91)-1.

U.S. Department of Commerce, Bureau of the Census. *Survey of Plant Capacity, 1990*. MQ-C1(90)-1.

U.S. Department of Commerce. *U.S. Industrial Outlook.*

USEPA, Office of Air and Waste Management, Office of Air Quality Planning and Standards. *Control of Volatile Organic Emissions from Existing Stationary Sources Volume II : Surface Coating of Cans, Coils, Paper, Fabrics, Automobiles, and Light-Duty Trucks*. EPA 450/2-77-008, May 1977.

USEPA, Effluent Guidelines Division. *Development Document for Effluent Limitations Guidelines and Standards for the Photographic Equipment and Supplies Segment of the Photographic Point Source Category*. EPA 440/1-80/077-a, May 1980.

USEPA, Office of Pollution Prevention. *Pollution Prevention 1991 - Progress on Reducing Industrial Pollutants*. EPA 21P-3003, October 1991.

USEPA, Office of Solid Waste and Emergency Response. *National Biannual RCRA Hazardous Waste Report (Based on 1989 data)*. EPA 530-R-92-027, February 1993.

"U.S. Fine Chemicals Demand," *Chemical Week*, January 6, 1993, p. 34.

U.S. Industrial Outlook 1993, Chapter 23 Photographic Equipment and Supplies.

Wolfman Report on the Photographic and Imaging Industry in the United States, 1989.

Wolfman Report on the Photographic and Imaging Industry in the United States, 1992.

Appendix 3-B

ALL SUGGESTED POLICY OPTIONS

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ALL SUGGESTED POLICY OPTIONS

Participants in the photoimaging industry expert panels selected four areas for focus in Phase 2 of the project:

- Removing RCRA Barriers to Centralized Treatment and Recycling of Silver;
- Developing and Promoting a Code of Management Practices for Photoprocessors;
- Continued research on Silver Speciation, Toxicity, Fate and Transport in the Environment, and Development of Analytical Methods; and
- Minimizing Inconsistencies in Regulation, Standards, and Enforcement Among the Federal, Regional, State, and Local Governments.

These four areas are discussed in detail in Section 3.3.3. The following outline provides brief discussions of the other policy issues and options raised during the panel meetings.

o EPA Will Provide Training and Flexibility for the Use of Mass-Based Limits by POTWs

This recommendation grew out of the view that use of concentration-based pretreatment limits discourages water conservation, and that POTWs are reluctant to use mass-based limits even though authorized to do so. There were mixed views in the expert panel meetings about whether use of concentration-based limits is a problem. Some participants said that concentration-based limits were derived from mass-based limits, and that permits were renewed every five years. It was left unclear whether the use of concentration-based limits in the photoprocessors' permits does or does not discourage water conservation. (A number of industry participants argued that it does.) Further, the reasons for POTWs' reluctance to use mass-based limits was not fully explored. More investigation of the true effects of concentration limits and the reasons for their use is needed before a determination can be made about the merits of pursuing this issue. Certainly, if use of concentration-based limits does discourage conservation of water, this might be a high priority area for further work. This idea could be included in a Best Management Practices plan, as part of efforts to minimize inconsistencies among regulations, or in a standardized permit application procedure.

o Monitor for Ionic Silver or Change Pretreatment Limits to Address Total Recoverable Silver

This was one of many proposals for regulatory change that related to differences in the toxicity of different forms of silver, and industry's view that the current regulatory limits are unnecessarily stringent. The argument for this proposal is that the limits imposed in the permit should be consistent with the toxicity assumptions underlying the limits -- the same form of silver should be the basis for each. Two factors stand in the way of this proposal: (1) the lack of a reliable analytic method for ionic silver, and (2) uncertainty about the relationship between discharges of other forms of silver

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and the amounts of ionic silver that become bioavailable. Further consideration of such policy actions should await the results of the research now being done on silver speciation, toxicity, and fate and transport, and development of improved analytical methods. This research was one of the four areas selected for emphasis by the expert panel.

o **Standardize the Permit Application Procedure for Minilabs**

This proposal arose from views that the permit application process is too costly and time-consuming for POTWs to implement, and for photoprocessors to go through, given the small size and large number of photoprocessors. One approach to streamlining the permit process might be to use the Best Management Practices now being developed as a basis for issuing a permit, or as the condition for a streamlined process. The first step is to complete development of the BMP, and for EPA to review and possibly endorse it. The BMP was another area selected for emphasis by the expert panel.

o **EPA Participation in Voluntary Standard-Setting Process**

The topic of standard-setting arose in two contexts. First, the NAPM coordinates the development of voluntary standards for the industry, and invites all interested parties (including EPA) to participate. These standards cover a wide variety of topics, and may in some cases have implications for the development of environmentally-beneficial products and processes. EPA could begin participating in future standards-development efforts, to help ensure that the standards promote rather than hinder innovative environmentally-beneficial technologies and products. The second arena related to standards-setting is the development of the ISO 9000 standards. These are standards developed by the International Organization for Standardization to define the elements of an effective quality system. While these standards are voluntary, they are expected to have a significant effect on firms' ability to compete in international markets, especially in European markets. Discussions are now underway on how environmental practice and policies will be reflected in the standards. One contact from Polaroid is participating in this work, and argues that development of the ISO environmental standards should be a major area of interest for EPA and for U.S. industry.

o **Develop Institutional Knowledge Base at EPA**

This suggestion arose from industry's complaint that high staff turnover at EPA (as well as in the state governments) makes it difficult to conduct effective conversations about regulatory issues that affect industry. They argue that much effort is needed to educate EPA staff about technical, economic, and environmental issues in the industry, before useful discussions about regulatory policy are possible. When a

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contact leaves, this process must begin all over again. No specific proposal for addressing this problem was made. However, there was a sentiment for finding ways to increase EPA's institutional knowledge base concerning this industry -- and the durability of that knowledge base.

o **Develop Life-Cycle Analysis Techniques**

There is lack of agreement in a number of areas about what constitutes environmental improvement or progress toward "sustainability" in the photoimaging sector. For example, claims about the environmental merits of a new Xerox film that does not use silver halide are disputed, because it uses selenium -- another toxic chemical. Some industry representatives argued that treating to very low levels of silver in effluent has perverse environmental effects because the current treatment methods require the use of chemicals that can be more toxic than silver. The environmental and economic effects of centralized treatment of photoprocessing wastes have not been analyzed. Even with the single-use camera, there are questions
about whether the high rate of recycling and the return of film along with the camera results in more or less solid waste disposal than conventional cameras. A cooperative life-cycle analysis of risks from photoimaging would provide the basis for judging whether certain trends and policies promote a more sustainable industry or not.

o Recognize Positive Environmental Performance

Firms that have taken active steps to improve their environmental performance would benefit from recognition of their efforts by regulators. Some industry participants argue that only negative attention is available now, and that from industry's perspective there is a strong disincentive to become more visible to regulators. For example, requesting help with compliance or approval to try something innovative that has the potential to result in environmental improvements is seen as a risky undertaking. It is thought that inspectors and regulatory officials do not give firms positive credit for their efforts (for example, by allowing them some flexibility in compliance schedules or immunity from enforcement actions to try potentially innovative but untested methods). Rather, "good actors" feel that they are nonetheless singled out for attention by enforcement staff. Several commenters felt that a system which provided official recognition for positive environmental actions would give them credibility with enforcement personnel. Such recognition would represent a competitive advantage, and perhaps encourage more positive relations with regulators. No specific suggestions were made for how such recognition might be provided.

ALL SUGGESTED POLICY OPTIONS

- **Facilitate Cooperation Among Manufacturers on Recycling Programs**

  It was suggested that EPA help facilitate and encourage efforts to increase the recycling of photoimaging wastes. This might include efforts from encouraging consumers to return solid wastes to encouraging area-wide pickups for silver recycling.

Appendix 3-C

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